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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/357,507 07/20/99 TAGUCHI

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EXAMINER

000570 IM22/0910
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ONE COMMERCE SQUARE
2005 MARKET STREET, SUITE 2200
PHILADELPHIA PA 19103

VARCOE JR, F

ART UNIT

PAPER NUMBER

1764

DATE MAILED:

09/10/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/357,507

Applicant(s)

Taguchi et al.

Examiner

Varcoe

Art Unit

1764



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Jun 25, 2001

2a) ☐ This action is FINAL.

2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-19 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on Jul 20, 1999 is/are objected to by the Examiner.

11) ☒ The proposed drawing correction filed on Jun 22, 2001 is: a) ☒ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☒ All b) ☐ Some* c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

20) ☐ Other: _____

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DETAILED ACTION

Response to Amendment

1. The amendment filed June 25, 2001, has been received and carefully considered. The drawing changes submitted on June 25, 2001, are acceptable. Claims 1-19 remain active.

Specification

2. The disclosure is objected to because of the following informalities: The amendment to the specification at page 10, filed June 25, 2001, states, among other things, that "Reference numeral 13 in Figure 3 is the same as reference numeral 3 in Figure 1." Applicant probably intends this to mean that reference numeral 13 in Figure 3 and reference numeral 3 in Figure 1 both refer to the air supply duct. This alternate phraseology is desirable because it places the element name in the specification in close proximity to the numeral. Furthermore, since 3 and 13 are not the same reference numeral, the present phraseology is confusing and should be modified.

Appropriate correction is required.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims.

With regard to claim 1, the reformed gas supplying segment and the reformed gas supplying pathway must be shown or the features canceled from the claim(s). Figure 1 shows a

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reformed gas inlet (2) (specification page 14 line 2) but neither a reformed gas supplying segment nor a reformed gas supplying pathway appears in the drawings.

With regard to claim 2, the “means for cooling the catalyst layer at the upstream side” must be shown in the drawings or the feature canceled from the claims. Figure 1 shows a heat exchanger 7 that is separated from the catalyst, not in thermal contact with it. At page 11 of the specification, the means for cooling the upstream side of the catalyst layer is described as a water-cooled apparatus. Figure 1 appears to show a water cooled apparatus for cooling the reformed gas upstream from the catalyst bed, but the drawing does not show a device for cooling the catalyst bed itself.

With regard to claim 5, the heating means (defined in the specification as a heater) is recited as utilizing reaction heat generated by reaction of carbon monoxide and hydrogen, but claim 2, from which this claim depends, utilizes a heater as shown in claim 1. It is not clear from the drawings that the heater shown is a heater that uses heat from the reaction of carbon monoxide and oxygen.

With regard to claim 12, the two branches are not labeled in the drawings. The specification at page 31, line 5 discloses “a branched pathway (108). But a catalyst layer heating branch and a catalyst layer cooling branch are not recited. Also, assuming that the two branches in Figure 8 are those branches, it is not clear which of the branches in the drawing is the cooling branch and which is the heating branch.

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Figure 1 contains reference number 12, but that number does not appear in the specification.

The reference numbers in the drawings should match the numbers in the specification, and the description of elements in the specification should match the description of elements in the claims. It is the responsibility of Applicant to check these items and correct any discrepancies found.

Appropriate correction is required. No new matter should be entered.

Claim Objections

4. Claim 19 is objected to because of the following informalities: In line 3, "obtains" should probably read "contains." Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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With regard to claim 1, it is not clear what is meant by a catalyst layer. Layers exist by virtue of other surrounding structures. A layer has to be laid on something. For example, in a column packed with particles and having multiple regions, a catalyst layer would be understood as one of several packed particle layers placed one above the other in the column. Since multi-layer structure is lacking in the present application, one must look elsewhere to find surrounding structure, leading to the assumption that the catalyst layer is a coating on a sheet of support material (an assumption supported by claim 4). But that becomes problematic when one tries to locate the upstream and downstream sides of the layer. A coating layer has two sides: one against the support and one facing away. Neither of these could be thought of as upstream or downstream. Furthermore, in claim 8, reformed gas passes through the catalyst layer, causing more difficulties understanding the layer as a coating. Here, it appears to be more like a bed having an upstream portion and a downstream portion, than like a layer. The pellets of claim 15 are more easily understood as forming a bed. Applicant can be his own lexicographer, but in so doing a definition of the term must be supplied.

Line 7 recites "... cooling said catalyst layer at an upstream side..." It is not clear what the side is upstream from.

With regard to claim 3, the two sides of the catalyst layer are described as being formed from different materials. But a side is a boundary, and thus can not constructed of any material. It is not clear what is intended. Does Applicant intend "upstream portion of the catalyst bed" and

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“downstream portion of the catalyst bed?” Further, it is not clear what is intended by “the activity” in line 4. This lacks clear antecedent basis in the claims.

With regard to claim 6, it is not clear what is meant by “a supplying amount” and it is not clear what the claimed correspondence is. Furthermore, it is not clear what structure is being claimed by claim 6.

Claim 7 recites the limitation “the passage through said cooling means” in line 4. There is insufficient antecedent basis for this limitation in the claims. Means for cooling the catalyst layer is recited in claim 1, but no passages are recited. The claim recites “... so as to heat said downstream side of said catalyst layer by a contact with said reformed gas” It is not clear how the gas contacts the catalyst layer. Other parts of the application indicate that what is intended here is a heat exchanger, not direct gas-to-catalyst contact. Perhaps what is intended is hydrogen purifying apparatus for selectively oxidizing CO, wherein reformed gas from a reformed gas supply passes in heat exchange relationship with the CO oxidation reactor in order to heat the downstream portion of the catalyst bed.

Claim 8 recites “said reformed gas flows in a first direction prior to passing through said cooling means.” The direction of flow does not further limit the claim because the direction is not described. The second direction is described as opposing the first direction, but since the first

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direction is undefined, the second direction is undefined as well. Also, it is not clear how the gas flows through the cooling means. The cooling means has been defined in the specification as a water cooled apparatus, but passing the gas through that apparatus has not been described.

With regard to claim 9, it is not clear what is meant by "placed on the periphery." The reaction segment is separate from the flow pathway. The reaction segment is not contained within the flow pathway. "On the periphery" usually means contained within, but located near the outer edge. The claim does not recite "outside the periphery." Does Applicant mean that the flow pathway is in contact with the reaction segment, perhaps in thermal contact? If so, claim 9 does not further limit claim 7. It is not clear what is meant by "before the passage through said catalyst layer." Further, this relationship does not appear in the figures.

With regard to claim 12, the catalyst layer heating branch heats the catalyst layer by means of the exothermic reaction on the catalyst. But it is not clear how the catalyst layer cooling branch carries out the cooling of the catalyst layer. Further, the catalyst layer cooling branch is described as being connected to the reaction segment at an upstream point of the catalyst layer. It is not clear from what the point is upstream.

Heating and cooling of the catalyst have been described in the specification as involving water coolant and a heater, both of which are connected to the reaction segment. The catalyst layer heating branch being "connected to said reaction segment" (claim 12 line 5) and the catalyst

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layer cooling branch being "connected to said reaction segment" (claim 12 line 6) are unclear statements of the relationships. It is not clear what sort of connection is intended. If the connection involves entry of the mixture of reformed gas and oxidant gas into the pathway that contains the catalyst, the claim should so state.

With regard to claim 14, the catalyst layer is recited as having two segments, but "the uppermost catalyst layer" lacks clear antecedent basis in the claims. Is what is meant "the reaction segment has a catalyst bed comprising an upper catalyst segment and a lower catalyst segment, wherein at least the upper catalyst segment has a part...?"

With regard to claim 16, while it is clear what it means for the uppermost layer to be larger than the lowermost layer, it is not clear what is meant by "with respect to an open area at the honeycomb lattice." What open area is intended? Is it part of the lattice or external to it? Is it this open area, as opposed to the catalyst layer, that is smaller for the lower catalyst layer?

With regard to claim 17, in line 4 "the alumina group material" and "the zeolite group material" lack clear antecedent basis in the claims.

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With regard to claim 18, it is not clear what is meant by "a catalyst which was heated..." Is this a preparation step? If this is a procedural step in the operation of the system, it recites no structural elements and thus is not a proper claim element in an apparatus claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

8. Claims 1, 2 and 5-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Heil et al., U.S. Patent No. 5,874,051.

With regard to claim 1, Heil discloses a hydrogen purifying apparatus for oxidizing and removing carbon monoxide in a reformed gas containing carbon monoxide in addition to the main component of hydrogen gas, the apparatus comprising a reaction segment (Figure 1 (5)) having a catalyst layer for oxidizing carbon monoxide, a reformed gas supply segment (2) for supplying the reformed gas to the reaction segment via a reformed gas supply pathway, and an oxidant gas supplying segment (3) for supplying an oxidant gas on the path of the reformed gas supply pathway.

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“Means for cooling...” invokes paragraph 6 of 35 U.S.C. 112. The specification at page 5 lines 24-27 recites “means for cooling the catalyst layer at the upstream side is a water-cooled apparatus.” Heil discloses a water-cooled apparatus means (Heil Figure 1 (6)) for cooling the catalyst at the upstream side.

“Means for heating” invokes paragraph 6 of 35 U.S.C. 112. The specification at page 12 recites “a heater as the means for heating the downstream side of the catalyst layer.” Page 16 lines 16-20 recite an electric heater, or alternatively, a heater using oxidation heat generated by CO and hydrogen, as the heating means for heating the catalyst layer at the downstream side. Heil discloses exothermic CO oxidation along the reactor path as a means for heating (Heil Abstract).

With regard to claim 2, Heil discloses a fluid means for cooling the catalyst layer (column 3 lines 50-65). Heil’s control of the oxidation of CO and hydrogen at various locations along the reactor path, including the downstream side of the catalyst layer (Heil Abstract), thereby heating the catalyst layer with heat given off by CO oxidation, amounts to a heater.

With regard to claim 5, Heil discloses heating the catalyst using reaction heat generated by the reaction of carbon monoxide and hydrogen in the reformed gas with the oxidant gas (Heil Abstract).

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With regard to claim 6, Heil discloses supplying an amount of oxidant gas that changes in response to the temperature of the catalyst layer (column 4 lines 28-49). However, changing a flow rate is a procedural step and not a structural element of an apparatus. Procedural steps in apparatus claims do not serve to patentably distinguish the apparatus from the prior art.

With regard to claim 7, Heil discloses a flow pathway of the reformed gas at a position adjacent to the catalyst layer (Heil Figure 1). In order for the reformed gas to interact with Heil's catalyst, the gas would have to flow adjacent to the catalyst layer. A partition (Figure 1) is needed to form the chamber that contains the reformed gas. The reformed gas heats the downstream side of the catalyst layer when the reformed gas contacts the catalyst layer. As stated above, it is not clear what is meant by the passage through the cooling means.

With regard to claim 8, Heil discloses passing the reformed gas through the catalyst layer in a second direction (Figure 1). Upstream from Heil's cooling chamber is a static mixer. In the static mixer the gas flows in many directions, including a direction opposite to the direction downstream in the cooling chamber.

With regard to claim 9, Figure 1 of Heil discloses the reaction segment placed on the periphery of the flow pathway before passing through the catalyst layer.

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Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al., U.S. Patent No. 5,874,051 as applied to claims 1 and 2 above, in view of Trocciola et al. U.S. Patent No. 5,330,727.

With regard to claim 3, the apparatus of Heil is essentially the same as that of the instant claim but fails expressly to include catalyst layers formed of different catalyst materials.

Trocciola discloses operating two different catalyst beds under different conditions that lead to different performance results (column 6 lines 1-36).

At the time of the invention it would have been obvious to one skilled in the art that getting different results from two different catalyst beds might best be accomplished by using

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two different types of catalyst materials. A variety of appropriate catalyst materials are available (Trocciola column 5 lines 4-10).

The motivation would have been to take advantage of the differences in the catalyst materials. Trocciola discloses operating the downstream catalyst at a lower temperature than the upstream catalyst (column 6 lines 1-36)

With regard to claim 4, Heil discloses using metallic support material for the catalyst (column 3 line 43).

12. Claims 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al., U.S. Patent No. 5,874,051 as applied to claims 1 and 2 above, in view of Kobylinski et al.

With regard to claim 7, Heil discloses essentially the same apparatus as the present invention but fails expressly to disclose a flow pathway of the reformed gas formed close to the catalyst layer via a partition so as to heat the catalyst.

Kobylinski discloses a catalyst system for processing a heated gas wherein the gas travels a pathway close to the catalyst layer and heats the layer through a partition so as to heat the downstream side of the catalyst layer (Kobylinski column 5 lines 15-26).

Kobylinski and Heil are analogous in that both deal with catalytic processing of hot gases in automotive applications.

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At the time of the invention it would have been obvious to one skilled in the art to combine the catalyst heating structure of Kobylinski with the apparatus of Heil.

The motivation would have been to control the temperature inside the catalyst bed (Kobylinski column 5 lines 15-26).

With regard to claim 8, Kobylinski discloses the gas first passing beside the catalyst layer in a direction opposite to the direction the stream later takes when passing in direct contact through the catalyst layer.

With regard to claim 9, Kobylinski discloses a reaction segment placed on the periphery of the gas flow pathway (Kobylinski Figure 1).

With regard to claim 10, Kobylinski discloses a reaction segment that is tube-shaped and where the flow pathway of the gas before passage in contact with the catalyst is formed around the reaction segment (Kobylinski column 5 lines 15-26).

With regard to claim 11, it would have been obvious to place multiple parts of the modified apparatus of Heil in parallel. The motivation would have been to permit one part to fail without affecting the performance of other, parallel, parts of the apparatus.

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13. Claims 12-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al., U.S. Patent No. 5,874,051 as applied to claims 1 and 2.

With regard to claim 12, Heil discloses a hydrogen purifying apparatus wherein there are a plurality of branches that supply gas from a reformed gas supply pathway and an oxidant gas supply. There is one such branch at the entrance to each unit of Heil's apparatus. At least one branch (the "catalyst layer heating branch") is connected at the middle point of the catalyst layer (since Heil has multiple catalyst portions, the middle point is that point where there are as many portions upstream as there are downstream), while there is another branch (the "catalyst layer cooling branch") that is connected to a unit upstream of the middle point.

Heil discloses essentially the same apparatus as the present claim but fails expressly to disclose a branched pathway formed by a bifurcation downstream from a connection between the reformed gas supply and the oxidant gas supply.

At the time of the invention it would have been obvious to one skilled in the art to split the flow path downstream from a connection between the reformed gas supply and the oxidant gas supply in order to supply a group of existing of the catalyst portions.

The motivation would have been to supply each of the portions with a gas mixture for processing and to enable further controlling the exothermal CO oxidation along the reactor path (Heil Abstract).

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With regard to claim 13, "means for changing" invokes paragraph 6 of 35 U.S.C. 112. The specification at page 26 line 17 recites "means for changing the cross-sectional areas ...in order to control the volume..." The specification at page 35 line 9 recites "branched volume control segment 107." These appear to be references to a valve. Heil discloses valves (4) used for changing the cross-sectional area of the reformed gas pathway and the branched pathway in order to control the amount of gas supplied to the reaction segment.

With regard to claim 14, Heil discloses a reaction segment with at least a two-segmented catalyst layer and at least the uppermost catalyst layer having a part with no catalytic function or a part with low reactivity to CO (Heil column 4 lines 2-5).

With regard to claim 15, Heil discloses a catalyst layer composed of catalyst pellets (column 3 lines 40-47) and metal support units. It is well known in the art to form metal support units for catalysts into honeycomb shapes.

With regard to claim 16, Heil discloses multiple catalyst segments (Figure 1). Lacking a showing of criticality, the relative sizes of parts of the layers is merely an obvious design choice.

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With regard to claim 17, Heil discloses catalyst layers comprising a platinum group metal supported by an alumina material and a platinum group supported by a zeolite (column 53 lines 39-41).

With regard to claim 18, Heil discloses an uppermost catalyst layer heated to a higher temperature than the lowermost catalyst layer (column 1 lines 50-57).

With regard to claim 19, "means for controlling" in line 4 invokes paragraph 6 of 35 U.S.C. 112. The specification at page 30 lines 20-21 recites "... controlling the volume of oxidant gas..." Heil discloses means for controlling the supply of oxidant gas (Figure 1 (4)). Heil discloses controlling the temperature in the system to achieve a desired temperature profile (column 6 lines 51-56) using metering devices controlled by a central control device (column 4 lines 45-49). Although temperature measuring apparatus is not explicitly mentioned, it is inherent in temperature control apparatus as described by Heil.

Response to Arguments

14. Applicant's arguments filed June 25, 2001, have been fully considered but they are not persuasive.

With regard to claim 1, Applicant argues that Heil fails to disclose the heating means of the present invention. Applicant's specification at page 16, line 18 recites oxidation heat

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generated by CO and hydrogen as the means for heating. Heil's apparatus also makes use of oxidation heat generated by CO as a means for heating. These two means are the same.

Applicant argues that Heil's means is the introduction of oxidizing gas. While it may be true that for Heil introducing oxidizing gas is a necessary part of generating heat, the relevant question for claim allowability is, first, what is Applicant's means and second, does Heil disclose that means.

The means is oxidation and Heil discloses it. Having established this, the location of the introduction port of the oxidizing gas is not relevant.

Applicant's argument describes a heater as involving indirect transfer of heat through the walls of a heater or a heating fin. Applicant states that this means is present in the present invention. Page 16 line 18 of the specification recites "oxidation heat generated by CO and hydrogen may be used for the means for heating the downstream side of the catalyst layer (1)." This description does not mention fins or heat transfer through walls.

Applicant argues that Heil's means for heating is not located at the downstream side of the catalyst layer. Examiner replies that since the heating means is the oxidation reaction, and since the oxidation reaction occurs at the downstream side of the catalyst layer, Heil's heating means is located at the downstream side of the catalyst layer.

With regard to claim 3, Applicant argues that Trocciola does not describe the catalyst in the upstream layer as being formed from different material from the catalyst in the downstream layer. While this is true, nevertheless, with a variety of suitable materials available (Trocciola column 5 lines 4-10), and different conditions required in the two catalyst beds, including

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different temperatures, choosing different materials is an obvious way to facilitate operation under the two different sets of conditions in the two different catalyst beds.

With regard to claim 7, Applicant argues that Kobylinski does not include a heating means as in the presently claimed invention for heating the catalyst layer at the downstream side. Kobylinski discloses heating means for heating the catalyst layer at the downstream side (column 5 lines 15-26). The motivation would have been to control the temperature inside the catalyst bed (Kobylinski column 5 lines 15-26).

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Varcoe, whose telephone number is (703) 306-5477. The examiner can normally be reached Monday through Friday from 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marian Knode, can be reached on (703) 308-4311.

The FAX telephone number for this Group Art Unit is (703) 305-3599 (for Official papers after Final), (703) 305-5408 (for other Official papers) and (703) 305-6357 (for Unofficial papers).

When filing a FAX in Group 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communications with the PTO that are not for entry into the file of the application. This will expedite processing your papers.

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Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

RV
September 6, 2001

NADINE PRENSCH
ART UNIT 1764

